Welcome and Introduction

- **Logistics**
- **Agenda for SDR Week**
- **SDR Purpose and Objectives**
- **Introduce Review Board**

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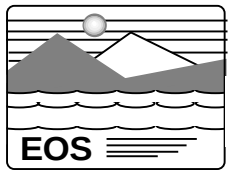
Logistics



- **Messages: Message board located on the first floor in lobby area.**
- **Pay phones: located on 1st and 2nd floors near auditorium.**

- **Phone (301) 286-7065 (Messages Only)**
- **Fax (301) 286-1710 (Reference ECS SDR attn: Deb Critchfield)**

- **Food**
  - **GSFC cafeterias are located in buildings 1 and 21. Area maps available at registration desk (Cafeteria hours: 11:00 a.m. - 1:00 p.m.)**
  - **Other lunch locations (All located across from GSFC in the K-Mart shopping center; please take your GSFC event badge/ car pass with you to ensure entry back on center): Hawthorne's, Gourmet Take-Away, Burger King**

- **Restrooms: located on each floor in hallways near the elevators**

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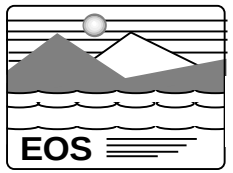
SDR Week's Events



- June 27, PM SDR
- June 28, All Day SDR
- June 29, All Day SDR
- June 30, AM Cost Briefing
- All Day Focus Teams* - DOAFT, DPFT, MOFT
- PM - DOAFT, DPFT and SOFT
- Integration & Certification Focus
- Team (ICFT)
- July 1, AM DOAFT, DPFT, MOFT and SOFT

* DOAFT = Data Organization and Access Focus Team
DPFT = Data Processing Focus Team
MOFT = Mission Operations Focus Team
SOFT = Science Operations Focus Team

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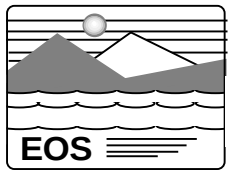
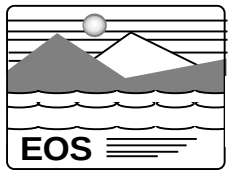
Cost Briefing and Focus Teams



- Meetings at University of Maryland University College Conference Center
- Cost Briefing - June 30, 1994 - 8:00 a.m. to noon
  - By invitation only (due to space limitation)
  - Broad invitation list
    - SDR Board
    - EOSDIS Advisory Panel
    - IWG members (1 representative per member)
    - NASA HQ (Program Managers, Program Scientist, and DAAC Program Scientists)
    - GSFC Senior Project Scientist and Project Scientists
    - DAAC Managers and Scientists
- Purpose of Cost Briefing
  - Show allocation of cost across EOSDIS Project elements
  - Will not answer all questions about cost of individual requirements, but will provide information to help the dialogue between Project and science community on cost vs value of system capability

This replaces page 4 of Dalton's Overview Presentation.

EOSDIS Requirements Scrub

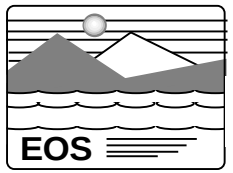


- **Review of EOS Program (including EOSDIS) requirements and budget**
- **Driven by:**
  - **$700M EOS Program budget reduction ($8.0B to $7.3B)**
  - **Requirement to restore contingency**
- **Began in late May, to complete in September with a progress report in early July**
- **Four study teams involved in scrub:**
  - **Technology Team (Chris Scolese)**
  - **Core Science Team (Mike King)**
  - **Independent Team (Jerry Madden)**
  - **IWG - EOSDIS Advisory Panel**
- **This Activity Does Not Affect SDR Requirements Baseline**
  - **SDR goal is scalable architecture & high level design - detailed Release designs will reflect Scrub**

Purpose of ECS SDR

- **Ensure that customer and developer concur that proposed design meets baseline functional and performance requirements**
- **Key factors to evaluate**
  - **Readiness to move to preliminary design phase**
  - **Risks, impacts, and mitigation plans clear**
  - **Design meeting baseline requirements and scalability**
  - **Evolvability of Design**
- **Target for SDR is design to support TRMM, AM-1, Landsat-7, Color, and V0 transition (Releases A & B) with ability to evolve 1999 and beyond to support PM-1, CHEM, ALT, AERO, ... (Releases C & D)**

EOSDIS Review Board



- **Bob Price (Chair)**
- **Bill Mack (co-chair)**
- **SDPS/CSMS**
  - **"Pull" users:**
    - **Ken Jezek (OSU - NRC Panel)**
    - **David Glover (WHOI - IDS/Data Panel Chair)**
  - **"Push" users:**
    - **Bruce Barkstrom (LaRC - CERES/Data Panel - Atmosphere)**
    - **Ed Masuoka (GSFC - MODIS SDST Lead)**
    - **James Stobie (GSFC - DAO)**
  - **Project Scientists:**
    - **Steve Wharton (EOSDIS Project Scientist)**
    - **Chuck McClain (GSFC - COLOR Project Scientist)**
  - **DAAC managers**
    - **Roy Dunkum (LaRC)**
    - **R. J. Thompson (EDC)**

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- SDPS/CSMS (Contd)
  - External System Developers (NASA)
    - » Nancy Palm (GSFC - Space Data and Computing Division)
    - » Phil Davis (GSFC - Earth Science Directorate)
  - External System Developer (non-NASA)
    - » Charles Zraket (Mitre/NRC Panel Chair)
- FOS
    - » Carroll Dudley (GSFC - Mission Operations Division)
    - » Paul Ondrus (GSFC - Mission Operations Systems Office)
    - » Jack Leibee (GSFC - HST)
    - » Dave Nichols (JPL - ASTER)

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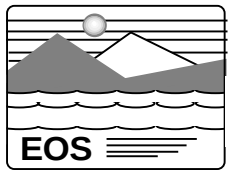
SDR Process



- **Review Board Chair/Co-Chair**
  - **Moderate group discussion**
  - **Ensure timely completion of presentation material**
- **Review Board**
  - **Review technical material**
  - **Capture key issues**
- **ESDIS Project responds to key issues within 4 weeks**
- **EOSDIS Advisory Panel and Focus Teams Meet following SDR to prepare coordinated RIDs (due by close of business July 8)**
- **ESDIS responses to all PDR-impacting RIDs due no later than PDR**

ESDIS Project Overview

- ECS / EOSDIS Context
- ESDIS Project Status / Schedule
- Event Summary Since SRR
- Requirements Baseline
- Data Products Baseline

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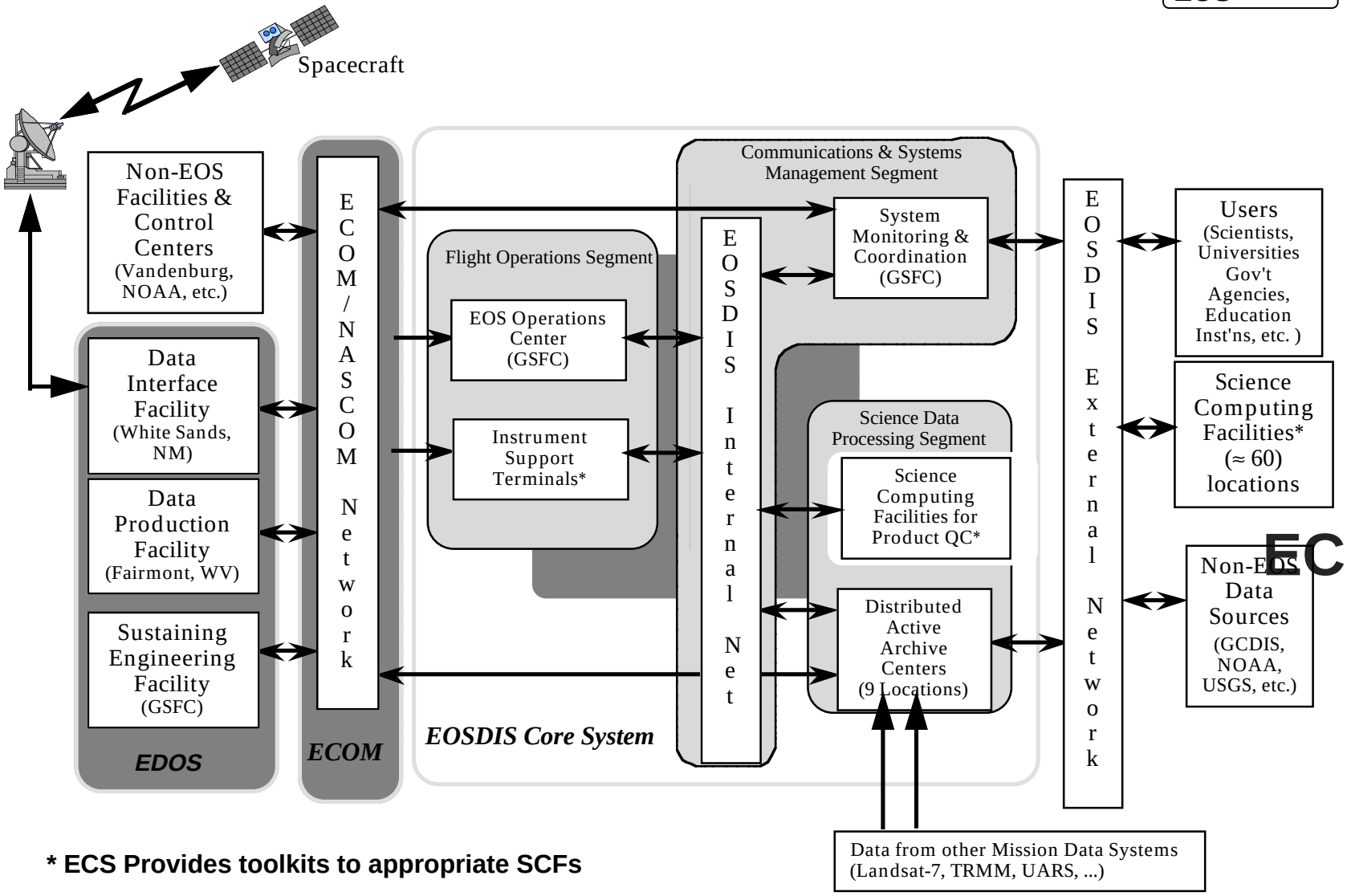

*** ECS Provides toolkits to appropriate SCFs**

ECS/EOS

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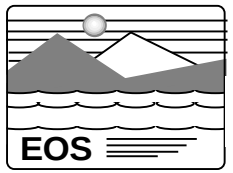
EOSDIS Components



	Function	EOSDIS Component
	Science data organization, access, user support	Distributed Active Archive Centers (DAACs) nine data centers, each focused on a science discipline area Common hardware and software elements deployed at the DAACs
ECS	Core functions for science data management Manage data archive Data search & browse	- Data Archiving & Distribution - Information Management - Product Generation
ECS	Science processing EOS spacecraft & instrument operations	EOS Operations Center (EOC)
	Algorithm development & QC at investigator sites	Science Computing Facilities (SCFs)
		External Networks Internet, NREN
	Distribution of data Acquire, process, & route telemetry data	EOS Data & Operations System (EDOS) EOS Communications System (Ecom)

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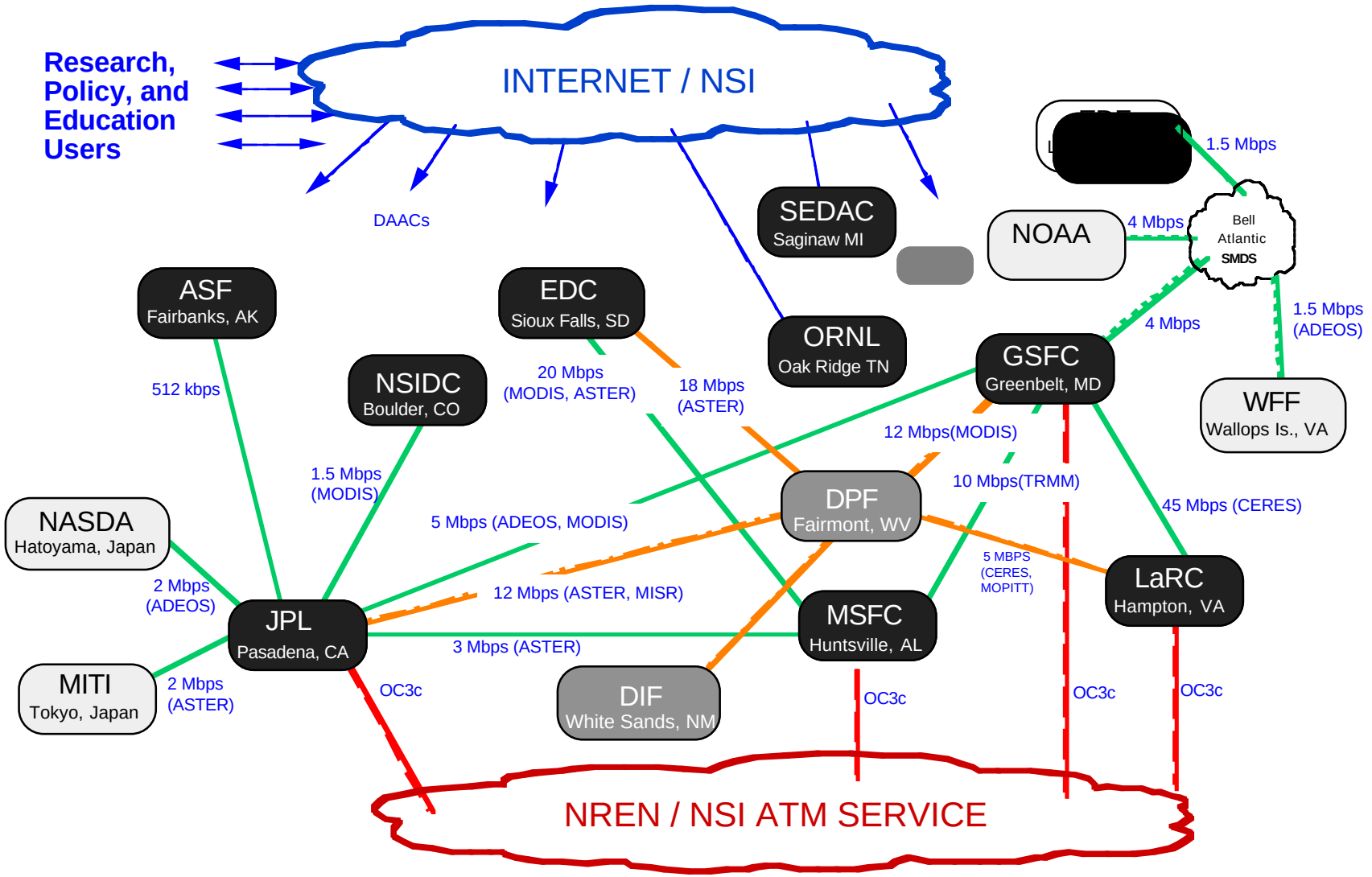
EOSDIS Networks

(1998)



Suitland, MD

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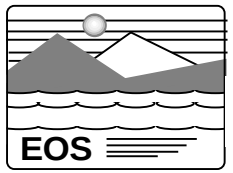
Schedule



EARTH OBSERVING SYSTEM DATA INFORMATION SYSTEM (EOSDIS)

STATUS AS OF: 6/16/94

MILESTONES	CY 92 (1 2 3 4)	93 (1 2 3 4)	94 (1 2 3 4)	95 (1 2 3 4)	96 (1 2 3 4)	97 (1 2 3 4)	98 (1 2 3 4)	99 (1 2 3 4)	00 (1 2 3 4)
EXTERNAL MILESTONES			SeaWIFS	RADARSAT	ADEOS	TRMM	EOS AM-1 LANDSAT-7	COLOR ADEOS-2	PM-1 9/30/01
EOSDIS VERSIONS			Version 0		Version 1	Version 2		Version 3	
EOSDIS CORE SYSTEM (ECS)	Award	SRR	SDR PDR	CDR	Interim Release 1 Release A	Release B		Release C	
EDOS	RFP		Award		Begin MO&DSD I/F	Begin AM1 GS I/F Testing EDOS Ops Sppt Capability Del.		Sys Upgrade #1 Delivery	
ECOM	SRR	SDR	PDR CDR		Begin MO&DSD I/F	Begin AM1 GS I/F Testing Ecom Ops Sppt Capability Del.	Sust Engr Capability Del. ORR		
SCIENCE SOFTWARE TRMM			Version 1 TRMM		Version 2 TRMM				
SCIENCE SOFTWARE AM			AM1 Beta Version		AM1 Version 1	AM1 Version 2	PM1 Beta Version	PM1 Version 1 PM1 Version 2	
EOS TEST SYSTEM (ETS)			SDR/PDR CDR	System I&T	ETS DIF Operational	EOC/DPF Available			

Events Summary since SRR

Progress Towards SDR Architecture & High Level Design:

- **December 1993 - Progress Review**
  - **Review for NASA HQ, EOSDIS Advisory Panel, and NRC Panel**
  - **Hughes presented Conceptual Architecture for ECS**
  - **Assessed a success by Reviewers**
- **March 1994 - Architecture Review**
  - **Review of architecture by Advisory Panel reps, DAAC reps**
  - **Continuing review by Architecture Working Group**
  - **Generally successful - comments flow to Hughes**

Events Summary since SRR (Cont.)

- **Independent Architecture Studies:**
  - **Three study teams [UC Berkley, George Mason U, U of North Dakota]**
  - **Studies began in March; interim reports received; final reports due in September**
  - **Goal is independent looks at ECS architecture as it may evolve circa 2000 and beyond - pacing item may be transformation of national communications infrastructure**
- **Use of Study Results:**
  - **Will make changes needed to enable additional evolvability, or to incorporate near-term improvements as appropriate within cost and schedule constraints**

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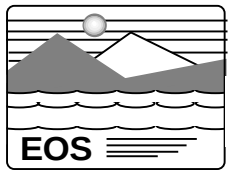
SRR RIDs Summary



Originating Group	Open RIDs	Closed RIDs	Total RIDs	% Open RIDs	RIDs Distribution
Data Panel	4	97	101	3.96%	11.01%
DPFT	0	18	18	0.00%	1.96%
SOFT-SCI	1	20	21	4.76%	2.29%
SOFT-OPS	1	13	14	7.14%	1.53%
DOAFT	0	25	25	0.00%	2.73%
MOFT	0	28	28	0.00%	3.05%
Others	7	703	710	0.99%	77.43%
Total	13	904	917	1.42%	100.00%

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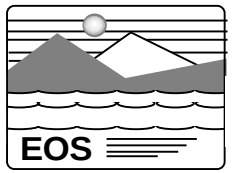
ECS Requirements Baseline for SDR



- **Functional and Performance Requirements (F&PRS) Document has been updated per SRR results and baselined by the Project for SDR**
- **Specific F&PRS Requirements are mapped to ECS Releases**
  - **Statements added to F&PRS to emphasize that requirements do not dictate architecture**
- **ECS Architecture is documented in the System Design Specification**
  - **This overrides any architecture implications in F&PRS**
- **External interface requirements are described in Interface Requirements Documents (IRDs)**
- **Statement of Work (SOW) - Updated Post SRR**
- **F&PRS and SOW include current mission baseline, ORNL and CIESIN DAACs**

EOS Data Product Baseline

- **Baseline Product List Provided by Project to Hughes:**
  - **Mike King's survey of Fall 1993 updated with MISR and MODIS Changes**
  - **Reviewed for application of processing efficiency factors***
- **Hughes is required at SDR to show an Architecture and High-Level Design supporting Scalability -**
  - **8X the baseline aggregate processing requirement**
  - **2X the baseline aggregate archive storage requirement**
  - **All other system impacts that follow from above (e.g. I/O, communications, working storage)**

***Normalizes estimates based on instruction counts vs benchmarks of actual code**

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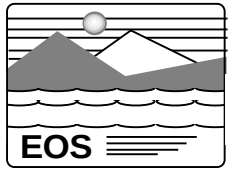
Requirements Issues/Risks



Issue	Impact	Mitigation Approach
• Product Growth	Resource Allocation	• "Cap" being developed for product capacity • Aggressive price/performance options being examined
• Distribution of Full "DAAC-like" functionality to SCFs	Resource Allocation	• System architecture allows for distribution of functions to SCFs
• DAAC Accesses requiring interactive archives, high-bandwidt collaborative environment	Resource Allocation	• System architecture allows for user method insertion, other interactive methods will be prototyped • Cooperative agreements with NREN prototyping efforts looking at high-bandwidth collaboration
Data Dependencies	Increased waiting storage; operational complexity impacts DAAC autonomy	• Detailed characterization in process • Dialog starting with Science Teams
Size and variability of user community	Matching services, resource allocation to user type	• Analyzing sensitivity to "data pull" require-ments • System design will support resource management based on user type • Project will management to resources • Proactively work with value-added providers • Need HQ policy and rational mechanism for fair resource allocation

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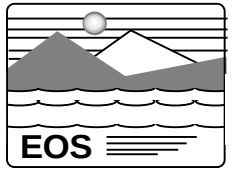
Technology Issues/Risks



Issue	Impact	Mitigation Approach
• COTS Product Maturity (Volume, rates, standards)	Technical Risk for "Near-term" Implementation	Technology Assessment Prototypes Samples: Ecom: ATM Testbed ECS: System Management Products, FSMS, Storage Media, Robotics, Pathfinder Algorithms on Parallel Architectures, Spacecraft Operations, Spatial Data Access
Long-term Evolution of technology	Ability to take advantage of new technology Accommodate inevitable change	Architecture Enables Evolution - NRC Panel Recommended study of direction of long-term Earth Science Environment (GCDIS/ UserDIS) - " Within cost, schedule, good design principles" will accept design constraints as per Study - Openness of Architecture Stressed - Improved systems engineering approaches (evolutionary requirements, evolvability tests) Prototyping with External University Community, NREN Independent Architecture Studies

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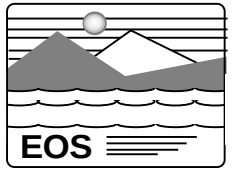
Technology Issues/Risks



Issue	Impact	Mitigation Approach
Open-distributed architecture	Cornerstone of SDPS Architecture	Version 0 Working Prototype Shows Distributed Search and Order Works COTS product technology assessments (Distributed Computing Environment at DAACs, Object Request Broker) Initiating end-to-end prototype in Distributed Search and Access
Integration Complexity	Twenty-eight key interfaces (some multiple components)	Integration and Independent Verification and Validation Teams

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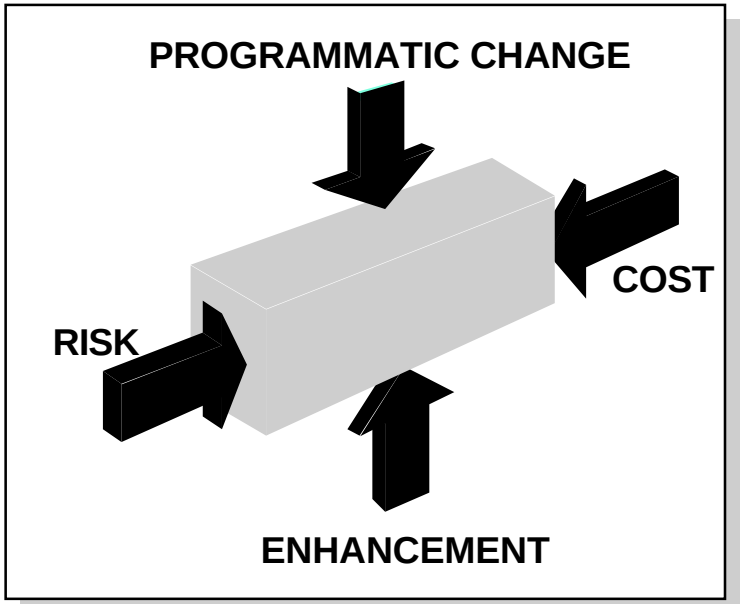
Requirements to Prototype and Evolve

Functions of EOSDIS

Mission Critical

- Control spacecraft and instruments
- Capture and deliver data stream
- Produce and long-term archive products
- Provide SCF linkage for data production and access
- Provide essential data access services
- Enable migration of functions based on technology changes and economics
- Enable insertion of user provided data access methods and connection to externally provided services
- Support prototyping of enhanced data access services

Mission Success



EOSDIS must address change in all of its functional areas.

Back-up charts

Preparing SDR RIDs

- RIDs may be written against the SDR presentation and the documentation specified in the SDR invitation letter
- Time period: RIDs are due by COB July 8th
- RIDs may be submitted via 3 mechanisms:
  - (1) Via hardcopy (paper) (non-project personnel)
  - (2) Via E-mail (non-project personnel)
  - (3) Entered directly into the FileMaker Pro database (Focus teams and project personnel)
- Please indicate whether your RID is an Issue or a Comment
- Please categorize your RID according to the categories defined in the instructions

RID Submission - Hardcopy

- RID forms have been distributed with the presentation material
- Instructions are provided on the back of the forms
- Turn in RID forms at or before the end of the SDR
- Or send RID forms by U.S. Mail to the address indicated on the form
- Or FAX RID forms to name and FAX number on the form

RID Submission - Email

- **Email RID template and instructions were distributed to those receiving the SDR Invitation Letter on June 9th**
- **Email RID template and detailed instructions and sample Email RIDs are available electronically via the ECS Document Handling System (EDHS)**
- **Email completed RIDs to the Internet address specified in the instructions**
- **Multiple RIDs may be included in one Email message (see instructions on the EDHS)**

RID Submission - Database

- **ESDIS Project personnel and Focus Teams will submit RIDs directly into a FileMaker Pro database. Each Focus Team will have a local, temporary FileMaker Pro database for RIDs originating in their organization.**

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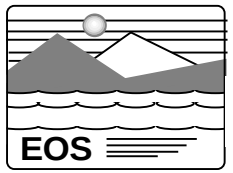
System-Wide Requirements



- **Level 1 Requirements - NASA Headquarters Controlled**
  - **Programmatic requirements reflecting top level Policy**
  - **Captured in EOS Execution Phase Project Plan, which represents HQ - GSFC Agreement on Mission**
- **Level 2 Requirements - Project CCB Controlled**
  - **Implementation Requirements responsive to Level 1's**
  - **Captured in baselined Level 2 Requirements Documents**
- **Level 3 Requirements - Project CCB Controlled**
  - **For ECS - Functional & Performance Requirements Document and Statement of Work**
- **Level 4 Requirements - Contractor CCB Controlled**
  - **For ECS - Specific and detailed build-to requirements for ECS Releases A - D**

Traceability is Mandatory!

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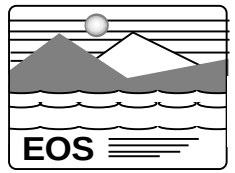
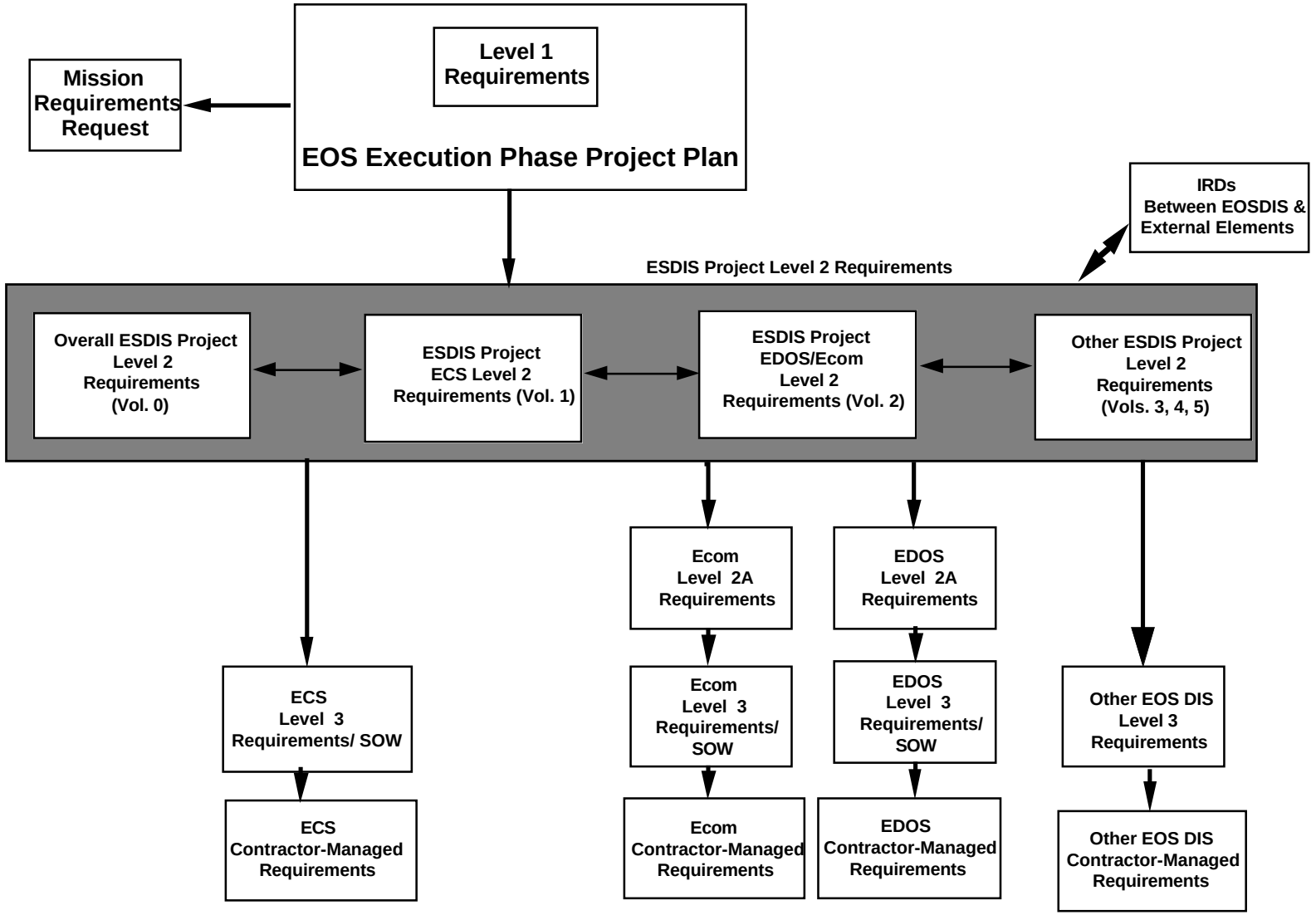
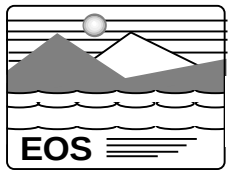
System-Wide Requirements





Policy Process



Policy Decisions ...

- **Programmatic policy decisions made by NASA Headquarters, generally in consultation with GSFC Office of the Mission to Planet Earth, ESDIS Project, and Project Scientists**
  - **In general - these affect Level 1 Requirements and the Project Plan**
- **Project Level policy decisions are made by Project Management with Project Scientist participation**
  - **As they affect Level 2 Requirements or controlled documents (e.g. ECS F&PRS and SOW) the Project Configuration Control Board approves**
- **RIDS or Science Advice that are recommendations for policy change are sorted to the right level for consideration**

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MTPE Prototyping Matrix

Risk Area*	MTPE NRA Proposal	PI/Organization
Open Distributed Architecture	• Tools/Tech. for Automating Anal. of EOSDIS Data • Integrating Distr. Object Mgmt. Tech. into EOSDIS • End-to-End Problems in EOSDIS • Multiresolution Info. Archival and Analysis System	Emery/U Colorado Muntz/UCLA Stonebraker/U Cal. Fussell/U Texas
User Req'ts for Interactive Access	• Intelligent Info. Fusion & Mgmt. Proto. for EOSDIS • Extension & Applic. of LinkWinds to EOSDIS • GIS for Character. & Modeling of Multiscale Data using Fractals & Selected Spatial Techniques • Intercomparison, Visualization & Analysis for Global Assimilated Data Sets & Satellite Data	Campbell/GSFC Jacobson/JPL Lam/LSU Palaniappan/GSFC
Storage Mgmt. & Technology	• Phenomena-Oriented Data Mining • Support for Large Data Sets in EOSDIS (HDF) • Performance Modeling of Mass Storage Archives	Graves/U. Alabama Folk/U. Illinois Johnson/U. Florida
Processing Load Wisconsin & Storage Volume	• Paradise Clusters: Inexpensive Scalable Support for Standardized Access to EOSDIS Data Sets • Tech. & Architecture Integration Project for Product Generation System • Auto. Cataloguing & Char. of EOS Data w/SE-trees	DeWitt/U. Lee/JPL Rymon/U. Pitt.

* Many proposals cover multiple risk areas.

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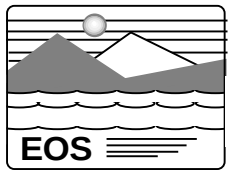
ESDIS Prototyping Matrix



Risk	Major Mitigation Plans
Open Distributed Architecture Immaturity of Distributed Computing products Immaturity of CORBA implementation Interoperability of Earth Science Data Models ATM Interoperability	• End-to-End Distributed Data Management • CORBA Contingency Analysis & Prototype • Assimilated Data Prototype • NREN / ATM Prototype
User Req'ts for Interactive Access Uncertainty of Requirements Cost of Technical Upgrades	• Data Interactive Prototype • Massively Parallel Processing I/O Tech.
Storage Management and Tech. Scalability and Maintainability of Archives	• Physical Data Format Standards • Storage Systems Standards
Processing Load & Storage Volume Algorithm Efficiency and Maintainability	• Algorithm Development Guidelines
Distributed Scheduling Complexity of Interorganizational Scheduling	• Distr. Data Production Sched. Prototype